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DÉODAT DOLOMIEU

By Dr. GEORGE F. KUNZ

THAT one of the foremost mineralogists of our day should have devoted a part of his valuable time to rescuing from partial forgetfulness the memory of a former incumbent of the place he himself now so worthily fills in the Muséum d'Histoire Naturelle, is a grateful reminder of the close ties that bind scientific men together. We allude to the interesting paper by Professor Alfred Lacroix, secrétaire perpétuel of the Académie des Sciences, on his predecessor of revolutionary times, Déodat Sylvain Guy Tancred de Gratet de Dolomieu, read at the annual meeting of the Institut, December 2, 1918.¹

Dolomieu was born June 23, 1750, at Dolomieu, near La Tour-du-Pin, in Dauphiné. He was the son of Messire François de Gratet, chevalier, Marquis of Dolomieu, Count of Saint Paul d'Izeau, seigneur of Tuelin, Saint Didier-les-Champagnes and other places, and of the high and mighty dame, Marie Françoise de Béranger. His noble lineage freed him from any care in the choice of a career. When but two years of age, October 2, 1752, his father entered him in the Order of Malta; on March 15, 1762, he was permitted to present his proofs of nobility, and two years later he was engaged as a volunteer in the *carabiniers*. He became second lieutenant in 1766, and then left on one of the ships of the order to pass his novitiate. On the cruise, in 1768, an unfortunate incident revealed the impetuosity of his character. Regarding himself as offended by one of his comrades, he landed with him at Gaetà in Italy, engaged in a duel, and killed his adversary. The strict rules of the order were immediately invoked; he was taken to Malta and put upon his trial. The sentence was expulsion from the order and life imprisonment; but at the expiration of nine months, his protectors interceded for him, and under the influence of the Duc de Choiseul, who acted under instructions from the King of France, and of Cardinal Torrigiani, who spoke in the name of Pope Clement XIII., the Grand Master of Malta relented and Dolomieu was not only set at liberty, but was reinstated in the order.

¹"Notice historique sur Déodat Dolomieu," Paris, Gauthier-Villars & Co., Imprimeurs, Libraires des Comptes Rendus des Séances de L'Académie des Sciences, 1918, 88 pp., frontispiece portrait, 8vo.



D. DÉODAT DOLOMIEU,
Membre de l'Institut National.

This incident probably had much to do with his later devotion to science, as it must have turned his mind to the more serious aspects of life. In Metz, where his regiment was garrisoned for a time, he associated with a man of scientific learning, Thyrion, who was in the pharmaceutical service and a demonstrator at the military hospital. With him, Dolomieu threw himself heart and soul into the study of chemistry and physics, but some unpublished correspondence shows that the young lieutenant was far from averse to the attraction of feminine society. It was also in Metz that he won the friendship of the Duke Alexandre de la Rochefoucauld, colonel of the regiment of the Sarre, and a member of the Académie Royal des Sciences, who was a fervent lover of mineralogy and who influenced the young man's studies in this direction. The duke introduced his protégé to the salon of his mother, the Duchess d'Enville, at the château de la Roche-Guyon in Paris, which was a favorite resort of the philosophers, scientists and leading politicians of that day. In 1775, he traveled in Brittany and sojourned for a time in Anjou. His manuscript notes give numerous descriptions of the mines and iron foundries of the province, and also present researches on the formation of saltpeter. It was at this time he published his first work: "Expériences sur la Pesanteur des Corps à différentes distances du centre de la Terre, faites aux Mines de Montrelay en Bretagne."²

In 1776, this Brittany trip was followed by a geological exploration in Sicily, succeeded by an Alpine excursion, after which, in 1778, Dolomieu returned to Malta, and was chosen as secretary by Prince Camille de Rohan, ambassador to Portugal. On August 19, 1778, the Académie des Sciences elected him as one of its correspondents, designating Daubenton as the member with whom he was to correspond. Two months later, he received the golden Spur as Knight of Malta, and in 1779 he was brevetted captain, but then retired from active service. The succeeding years brought him the title of Commandeur de Dolomieu. He now made a long journey in Sicily, and entered into friendly relations with Gioeni of Catania, and in 1782 traversed the Pyrenees on a botanizing tour in company with Picot de Lapeyrouse, the botanist of Toulouse. Returned to Malta, he pursued meteorological studies and wrote a memoir on the climate of the island which was printed with the approbation of the Académie.³

² *Journal de Physique*, Vol. VI., 1775, pp. 1-5.

³ This forms part of the "Voyage aux Îles Lipari," etc., Paris, 1783. VOL. VII.—34.

At Malta, the principal dignities were regularly assigned to the chiefs of the different nations, or "tongues," constituting the order, and the office of marshal was given to the Langue d'Auvergne to which Dolomieu belonged. He was chosen to fill this place in 1783, thus becoming governor of the city and commander of the troops, but offended at a decision taken by the Grand Master of the Order that seemed to him to be an attack on the rights of his "tongue," and his respectful remonstrance having been disregarded, he sent in his resignation and voluntarily exiled himself to Italy, where he was at least able to carry on his geological investigations. Toward the end of 1786, he returned to Malta, and offered himself as candidate for a vacant place on the council of the order. His project was bitterly opposed by his enemies, who raked up some secret letters from the King of Naples containing accusations of political errors, and his name was withdrawn.

With the outbreak of the Revolution, Dolomieu became one of its most earnest partisans, but the excesses of the Terror almost shook his faith in the eventual success of the principles that had been proclaimed. On November 27, 1792, he writes:

I had long believed that it was a blessing to live, since we had the hope of a happy future; now, however, I think that it is no misfortune to die. The only sentiment that still sustains me in the course of existence is that of curiosity; what will be the end, what will be the results of the strangest crisis that the peoples of Europe have ever traversed?

Still, this period was marked by a number of publications: his long "*Mémoire sur les pierres composées et les roches*" (1791-1794); a study, "*Sur les pierres figurées de Florence*" (1793); an adaptation of his "*Distribution Méthodique des matières volcaniques*" (1794); his "*Mémoire sur la constitution physique de l'Égypte*" (1793). His merits as a savant received full recognition. When in 1795 the Convention organized the Corps des Mines, he was named inspector; from the beginning of 1796, he was charged with the course of physical geography at the Ecole des Mines and his lectures were brilliantly successful. The year previous, he had been chosen a member of the newly founded Institut, created by the law of 3d Brumaire, An IV. (October 25, 1795).

When Napoleon Bonaparte sailed in 1798 on his adventurous expedition to Egypt, Dolomieu accompanied him, as did many other noted French savants, first having secured from Bonaparte the assurance that no hostile action would be undertaken against Malta. However, when the French fleet arrived there, the capitulation of the town was demanded and necessarily ac-

corded. Although Dolomieu did what he could to make the situation less painful, and is said to have made a rather lively protest to Bonaparte, the event was not forgotten by his enemies in the order. In the short-lived Institut d'Egypte he was a member of the section of physics, and did much useful work during his brief stay in the land. However, his health began to give way, and on March 7, 1799, he embarked from Alexandria with Generals Dumas and Manscourt, and his young pupil Cordier, who later became a member of the Académie des Sciences. They escaped the danger from the watchful English fleet, but were assailed by a violent tempest and forced to take refuge in the Italian port of Taranto. Here the Counter Revolution had already broken out and the luckless passengers were straightway arrested and thrown into prison. Two months later they were taken to Messina, where, to satisfy the grudge entertained by some Sicilian Knights of Malta dwelling in the city, Dolomieu was separated from his companions and confined as a criminal on orders from Palermo. In the city prison, he was locked up in a dark cell and subjected to the most rigorous treatment by a cruel jailer. He had been able to smuggle in on his person a few books, and he managed to compose several works by writing on the margins and all other blank spaces in his books, using as a pen a sliver of wood and for ink, lamp-black made with the smoke of his lamp. Professor Lacroix informs us that he has found one of these unique books in the library of the Muséum. It is a copy of the "*Minéralogie des Volcans*," by Faujas de Saint Ford, and on the reverse side of the guard-leaf Dolomieu had written this touching appeal:

I beg that any person into whose hands this book may fall, I supplicate him by all the motives which can touch his feelings or interest his honor or his delicacy, I supplicate him by all that he holds dearest, to have it taken to France to my sister, Alexandrine de Drée, born Dolomieu. She lives in Paris, Rue de Lille, near the Rue de Beaune, or at Chateaufort, near Roanne, department of Saône-et-Loire.

I beg my sister, Alexandrine de Drée to give ten gold louis, equivalent to sixty Neapolitan ducats, to the person who shall hand her this book, which is the last testimony of my affection for her.

On the title-leaf are instructions for his heirs, and farther on are notes relating to the beginning of the Egyptian expedition, to the capture of Malta, to his return to Europe, and then a plaintive litany as to his sufferings in his Messina prison. This is followed by many brief characterizations of those with whom he had been in friendly intercourse.

Although the relations between France and England, even

during the succeeding short period of quasi-peace, were far from cordial, the Institut did not hesitate to seek the help of the influential Royal Society of London, addressing an earnest request to Sir Joseph Banks, president of the society, for his good offices. He in turn appealed to Sir William Hamilton, the English ambassador at Naples, to Lady Hamilton, a great favorite at court, and to Lord Nelson, then in command of the English fleet in the Mediterranean. Finally, an appeal was made to Charles IV. of Spain, who sent two personal letters to the King of the Two Sicilies, making an earnest appeal to his sense of humanity, and urging him to have Dolomieu set at liberty. However, it was not until after the victory of Marengo that real and effective help was given. On February 2, 1801, Bonaparte wrote to Talleyrand that the freeing of Dolomieu was to be made one of the express conditions to be imposed on the Sicilian monarch, and Article VII. of the armistice which was followed a few days later by the signature of the Peace of Florence, March 20, 1801, specified: "The Citizen Dolomieu, General Dumas and General Manscourt, and all the Frenchmen imprisoned on their return from Egypt, shall be immediately given up."

The short remainder of Dolomieu's life was marked by a triumphant return to Paris, where he began at the Muséum the course of lectures on mineralogy with which he had already been charged in January, 1800. Before many months had passed, he was seized with a longing to view again the mountains so dear to him, and he toured once again in Dauphiné, Savoy and Switzerland, receiving everywhere a warm welcome from his friends. Finally, he visited his sister and his brother-in-law, De Drée at Chateauneuf, in Charollais. It was while in their home that death overtook him after a brief illness, November 26, 1801. Without doubt his demise was the result of the rigors of his imprisonment at Messina.

The eventual fate of the collection of minerals that Dolomieu had so lovingly assembled during his travels became a considerable source of anxiety for him. At one time he thought of selling it to the University of Palermo, and again he entertained the idea of presenting the objects to the city of Grenoble, or to the Académie of Lyons. Finally, in a letter to Picot de Lapeyrouse, dated December 15, 1790, he expresses himself as follows:

Everything ripely considered, I have arrived at a decision which will surprise you. I propose to send it [my collection] to the Congress of the United States of America. I shall make this gift of the products of the

old world on the condition that, a hundred years from now, there shall be sent to my country a collection of the products of America, that there will have been time to gather together and to arrange. In this way I shall render myself useful to those brave men who have learned to know the value of liberty. I shall supply them with objects of comparison between the old and the new world, and in a century, my country will receive the donation that I intend to provide for of the exchange collection from America. I shall, however, attach this condition, that America be not forced to make this return unless my country has preserved her liberty.

Although this generous project was never realized, Professor Lacroix adds that at the expiration of the century, the late J. Pierpont Morgan unknowingly fulfilled the wish of Dolomieu by presenting to the Muséum d'Histoire Naturelle in Paris, a complete collection of American gems. And since then the people of the United States have given to France something more precious than rare gems, the best of their sons, because France has preserved her liberty at the same time that she has striven for the defense of the world's freedom.

Dolomieu's field of study embraced all the knowledge that had been attained in his day on the different branches of mineral science—mineralogy proper, lithology, geology and terrestrial physics; but it was more especially in the study of volcanoes and volcanic products that he himself left an indelible trace. Already in 1752, Guettard, a member of the Académie des Sciences, in the course of a journey through Auvergne, discovered the first extinct volcanoes that had been remarked outside of the regions in which active volcanoes existed, and he determined that these extinct volcanoes resembled the actual ones in all respects except their activity. This opinion was confirmed ten years later by Demarest, another member of the Académie, who was able to establish the existence of a series of periods in the successive eruptions of these extinct volcanoes. He recognized the influence exerted upon them by atmospheric erosion; he reconstituted the progressive succession of the phenomena that have little by little destroyed the crater-cones, carried away the scoriæ, smoothed off the scoriated surface of the chimneys, disassociating these in scattered fragments, so as to reach at last their granitic substratum, and finally to hollow out deep valleys dominated on either side by horizontal levels, the last vestiges of powerful and continuous discharges in former times. Thus he demonstrated the identity of the black lavas forming the cones with the basalts, either massive or in fine prismatic colonnades, while before this time lavas and basalts had been regarded as rocks of diverse origin.

The main part of Dolomieu's descriptive work concerns the

volcanoes of southern Italy. He had witnessed eruptions of Vesuvius and of Etna, and carefully studied the discharges, and he had never doubted that the lavas came from great depths; thus even before the term had been coined he was a "vulcanist." His first publication on this subject treats of the Æolian (Lipari) Islands.⁴ From 1781 he had presented evidence that in these islands were volcanoes which had arrived at various stages of development; one of them, Stromboli, had been active from early times, though its eruptions were not violent, while another, Vulcano, offered the phenomena of occasional but exceedingly violent eruptions. There were also fumaroles and hot springs, as well as extinct volcanoes. Other extinct and eroded volcanoes are to be seen in the Ponza Islands off Naples. These were described by Dolomieu in 1784,⁵ and he distinguished the varying character of the tufas, some having a miry origin while others were of submarine production. He studied as well the islands of Ischia and Procida, and completed the description given by Hamilton. Mount Etna and the Cyclopes furnished Dolomieu with material for many interesting memoirs; but more important is his study of that part of the island of Sicily called the Val di Noto, situated northwest of Syracuse.⁶ Here he described the remains of volcanoes older than Etna. Finally, at the western extremity of Sicily, in an exclusively sedimentary region, between Aragona and Girgenti, he noted a strange phenomenon, the so-called "*macabula*," which he designated with the name "air volcano." In the midst of the plain, arise small hillocks of clay, whence issue jets of silicious, cold mud, which spreads over the sides of the hillock like lava. This mud is ejected by discharges of gas. Dolomieu appears to have been the first to describe this phenomenon correctly and at length.

In a letter of April 2, 1790, written to Gioeni, Dolomieu declared that "the most important part of mineralogy is lithology." In estimating his work in this branch of science, we must bear in mind the immensely greater resources at the command of the investigator of our day, as compared with what

⁴ "Voyages aux Îles de Lipari fait en 1781, ou Notices sur les Îles Aeoliennes, pour servir à l'histoire des Volcans," by M. le Commandeur Déodat de Dolomieu, Correspondant de l'Académie des Sciences, etc., Paris, 1783, 208 pp., 8vo. German trans. by L. C. Lichtenstein, Leipzig, 1783.

⁵ "Mémoire sur les Îles Ponce, et Catalogue raisonné des produits de l'Etna," Paris, 1788, vi + 527 pp., 1 plate, 4 maps, 8vo.

⁶ "Mémoire sur les Volcans éteints du Val Noto en Sicile," by Déodat de Dolomieu, Commandeur de Malta, Correspondant de l'Académie des Sciences, *Journ. Phys.*, Vol. XXV., 1784, pp. 191-205.

was available toward the beginning of the nineteenth century. Then almost all the exact means of testing and experimentation were still to be discovered, and indeed the exact science of lithology dates back little more than a half-century. Dolomieu may, however, be credited with having accomplished all that was practicable with the feeble resources at his command, and the results he attained command our respect, in spite of occasional inexactitudes and lack of precision. What were qualified by him as the primordial rocks included not only granite, but also our eruptive rocks, with the exception of the volcanic ones, all our crystalline schists, and in a general way all the metamorphic rocks. These he considered to have resulted from the simultaneous crystallization of their constituent minerals in a fluid. As he well knew that these minerals are not soluble in water, he believed that this was accomplished by some chemical composition which rendered possible the dissolution of the minerals, and which then disappeared, leaving no trace behind. This shows that he had a certain conception resembling the later idea of mineralogizers. As to the volcanic rocks, whose igneous and intertelluric origin he always proclaimed, he did not look upon them as we do to-day, as resulting from the consolidation of a fused magma, he believed them to have resulted from the fusion, under the influence of subterranean fires, of deep-lying rocks, already consolidated and belonging to the primordial region. He rejected the theory held by his predecessors as to a purely granitic origin, and held that the diversity of these rocks depended upon the fact that each of them derived its origin from a special type of primordial rock, or else from a mixture of different primordial rocks. As is known, this idea has not yet entirely disappeared from science, there being still some geologists who consider granite as having been formed by the fusion of sediments at the bottom of geosynclinals.

In what regards the formation of lavas, Dolomieu resorted to the experimental method. In the glass-works, at Creusot, where an attempt had been made to form bottles out of fused basalt, he had seen the crucibles filled with a perfect glass; the lower part might sometimes indeed be rather dull, resembling black porcelain, but still differing much from the finely crystallized basalt that had been treated. Dolomieu overhastily concluded that the basalt did not result from a real vitrification comparable to that of glass, but had been produced by a special mode of fusion. However, if he could have used a petrographical microscope, he would have seen that the texture

of the mass at the bottom of the crucible was due to the presence of crystals which were almost identical with those of natural lava.

Our limited space does not permit us to give more than the above details as to the researches of Dolomieu in his favorite domain, and in presenting so much, we have elected to follow very closely the words of Professor Lacroix. His publication is embellished with an excellent reproduction of a portrait of Dolomieu, painted in Rome, in 1789, by Angelica Kaufmann, and portraying her sitter as he appeared in his fortieth year. His oval face, lighted up by expressive blue eyes, his long blond hair, already slightly streaked with gray, gives a pleasing idea of his personal appearance. He was quite tall, his height being given on his passport as five feet eleven inches of the old French measurement. He was never married.

Professor Lacroix has provided a full and detailed bibliography of Dolomieu's publications, as well as a list of about two hundred unpublished letters from him, and gives us the assurance that he will issue these before long. In conclusion, there are twenty closely-printed pages of explanatory and illustrative notes.